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INFLATION INDICES AN INTRODUCTION TO BASIC THEORY AND  
THEIR APPLICATION WITH SAMPLE PROBLEMS(U) ARMY TROOP  
SUPPORT COMMAND ST LOUIS MO W H GILLE OCT 84

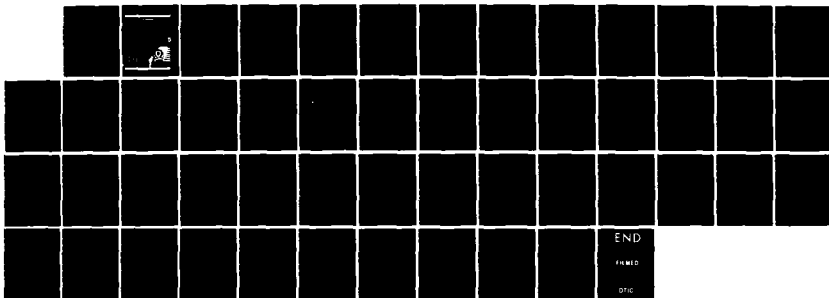
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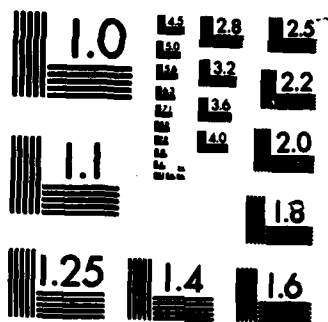
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**COST MEMORANDUM**

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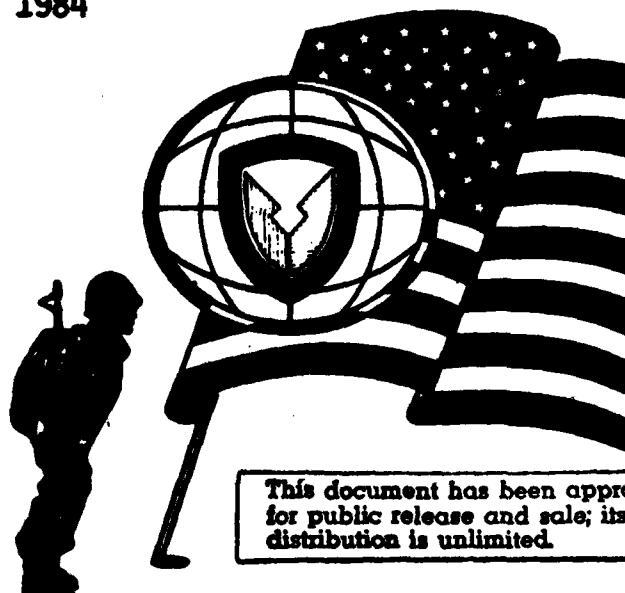
**AN INTRODUCTION TO BASIC THEORY AND THEIR APPLICATION  
WITH SAMPLE PROBLEMS**

**WARREN H. GILLE, JR.  
OCTOBER 1984**

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**U.S. ARMY TROOP SUPPORT  
COMMAND (TROSCOM)  
COMPTROLLER  
COST & SYSTEMS ANALYSIS DIVISION  
COST ANALYSIS BRANCH**

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I N F L A T I O N   I N D I C E S

AN INTRODUCTION TO BASIC THEORY AND THEIR APPLICATION, WITH SAMPLE PROBLEMS

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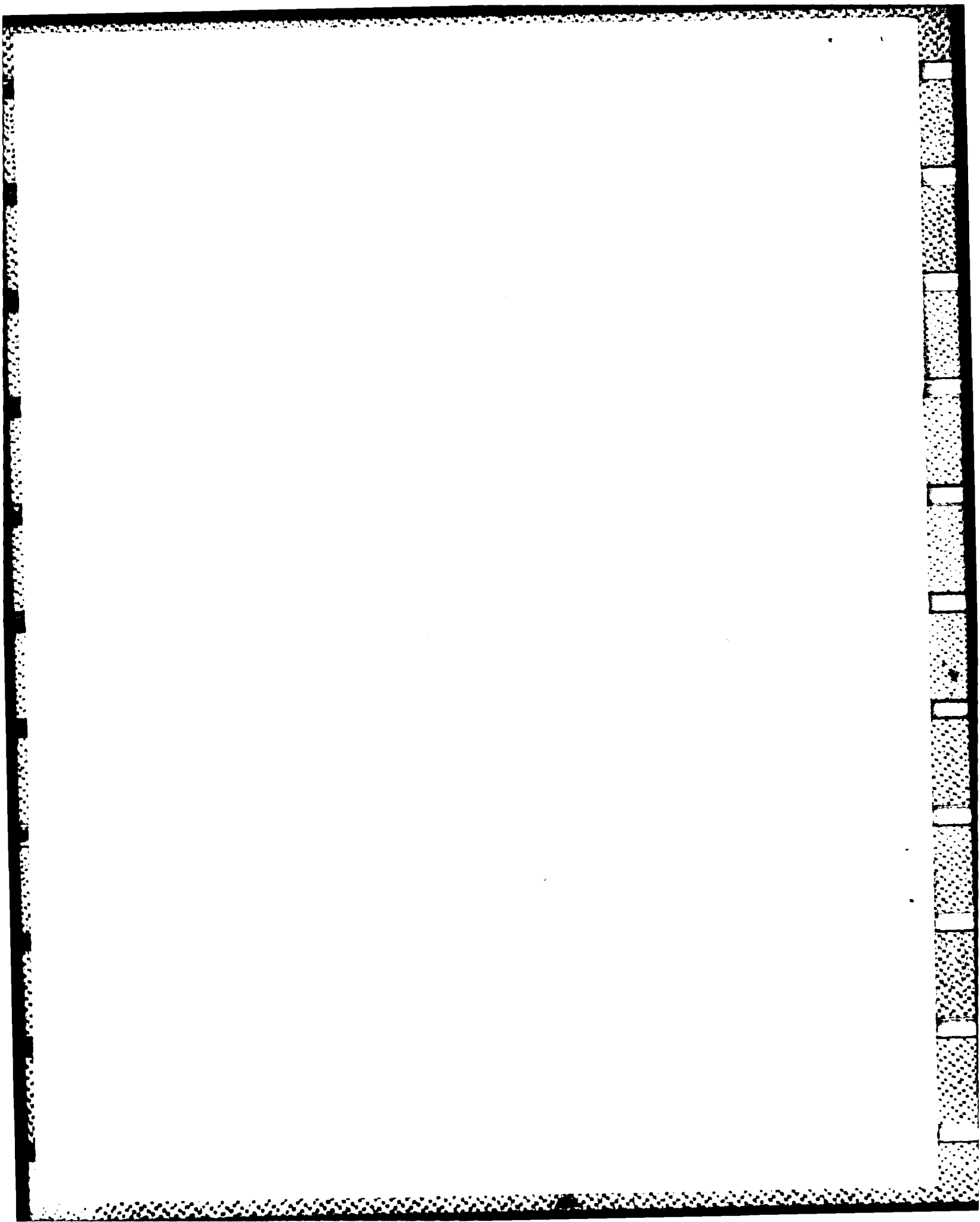
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### ACKNOWLEDGEMENTS

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## INFLATION INDICES

An Introduction to Basic Theory and Their Application, With Sample Problems

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*include:*

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*A*

*A*



1. STATEMENT OF PURPOSE. This study explores the topic of inflation indices, what they measure, and how they are applied. It is intended for use by individuals who don't have a technical background in economics or indexing theory. The goal is to provide a basic explanation of how inflation indices are developed and how they are used, through illustrative examples. Topics → (to PA)

2. INTRODUCTION. Inflation has far reaching effects for every sector and every economic group in American society. In the private sector, inflation causes a redistribution of income from fixed income groups to wage earners, and among firms in the marketplace. In the government, it creates problems for program and project managers due to unanticipated shortfalls of budget dollars against unchanging materiel requirements. Due to the need to budget more accurately, and to estimate costs in the year in which they occur, analysts performing cost and budget studies must have a basic understanding of how inflation indices are developed and how they are applied. This is the purpose of this study. In addition to providing educational documents such as this report, Comptroller, Cost Analysis Branch (AMSTR-CCC) serves as the TROSCOM Inflation Focal Point, and provides instruction and consultation concerning inflation indices and their use.

3. BASIC TERMINOLOGY AND CONCEPTS.

a. TERMINOLOGY:

(1) BASE YEAR - The first year or year of reference for an index.

The index is 1.0000 in this year and changes each succeeding year.

- (2) CONSTANT DOLLAR ESTIMATE - A cost or budget estimate which assumes that no inflation will occur in any of the project years. (To be used for the purpose of comparison with inflated dollar estimates).
  
- (3) INFLATED DOLLAR ESTIMATE - A cost or budget estimate which specifies the number of dollars needed at the time of expenditure, not the number of dollars needed if the items were bought on the spot, today.
  
- (4) INFLATION - A general decrease in the purchasing power of the unit of account (dollar).
  
- (5) INFLATION INDEX - A numerical index used to adjust for the effects of past or future inflation.

The two types of inflation indices and their applications are:

Historical: Measures the cost changes from the past until now.

Projected: Forecasts inflation in future years for use in cost and budget estimates.

- (6) INDEX - A numerical procedure for tracking cost changes over time.

Example - Average Retail Price of Sugar (CY 80 Base)

<sup>*</sup> Sugar 5lb bag	<u>CY 80</u>	<u>CY 81</u>	<u>CY 82</u>	<u>CY 83</u>	<u>CY 84</u>
Price (Dols)	\$1.69	\$3.10	\$2.71	\$1.61	\$1.29
Price Index	1.000	1.834	1.604	.953	.763

\*Year of reference (base year) for index is Calendar Year (CY)

1980.

- (7) OUTLAY OR SPENDOUT RATE - If a project covers several years and a certain amount is spent in each year, the percentage of project funds expended in each year is termed the outlay rate or spendout rate (percentage) for that year. The entire schedule of spendout rates (percentages) is called the outlay schedule or outlay pattern.

b. CONCEPTS, WITH EXAMPLES:

ESCALATION FACTOR - A one-year inflation factor which moves cost from one year to the next. For example, if the FY 84 escalation factor is 1.08, this means that the inflation experienced from FY 83 to FY 84 is 8%. If 1.08 is multiplied times FY 83 cost, the new cost figure is the previous figure plus 8%. Monthly escalation factors (one-month changes) are developed by some agencies such as Bureau of Labor Statistics (BLS), but usually are not of much interest because month

to month cost changes are, generally, quite small.

Example: Use of Escalation Factor

$$(\text{FY 1983 cost}) \times (1.08) = (\text{FY 1984 cost})$$

FY 84  
Escalation  
Factor

COMPOUND INDEX - An inflation factor which translates cost forward or backward for a multi-year period. It is the product of the individual, one-year escalation factors. For example, if the escalation factor for FY 84 is 8% and the escalation factor for FY 85 is 7%, then the compound index for FY 85 is  $(1.08) \times (1.07) = 1.1556$ . That is, for the two year period FY 83 to FY 85, cost increased 15.56% for this item. The compound index, obviously, is created by multiplying (compounding) the individual rates, the same procedure that is used to compound interest on a savings account.

Example: Use of Compound Index

$$(\text{FY 83 cost}) \times (1.07) \times (1.08) = (\text{FY 83 cost}) \times (1.1556) = \text{FY 85 cost}$$

FY 84	FY 85	Compound
Escalation	Escalation	Inflation
Factor	Factor	Factor
(83 to 84)	(84 to 85)	

Individual escalation factors are multiplied to get a compound index of 1.1556.

COMPOSITE INDEX: - A composite index is an index used to inflate multi-year projects. It is calculated by inflating the percentage of funds spent each year by the appropriate compound inflation factor. Examples illustrating how they are calculated and used follow.

Example: Impact of Differing Spendout Rates

Suppose we have a one million dollar project which will last two years, say FY 84 and FY 85, and suppose that the current year is FY 84. Suppose that the FY 85 escalation rate is 10% (1.10).

a. If 75% of the project's funds are spent in FY 1984 and 25% in FY 1985, then,

<u>CURRENT YEAR</u> <u>FY 1984</u>	<u>FY 1985</u>
750,000	250,000 x 1.10 = 275,000
750,000 + 275,000 = <u>\$1,025,000</u>	

b. However, if 20% of the project's funds are spent in FY 1984 and 80% in FY 1985, then,

<u>CURRENT YEAR</u> <u>FY 1984</u>	<u>FY 1985</u>
200,000	800,000 x 1.10 = 880,000
200,000 + 880,000 = <u>\$1,080,000</u>	

So, when the money is spent does make a difference.

Example: Inflating a Three-Year Project

One Year Escalation Rates

<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>
1.000	1.049	1.046

Compound Inflation Factor for FY 84 to FY 86 is  $(1.049) \times (1.046) = 1.097$

Spendout Schedule

	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>
\$3.5 million project	.7m (20%)	2.1m (60%)	.7m (20%)

COMPOSITE INFLATION INDEX CALCULATION

	<u>FY 1984 CONSTANT DOLLARS</u>		<u>FY 1984 INFLATION INDEX</u>		<u>FY 1984 INFLATED DOLLARS</u>
1984	.7m	x	1.000 (current year)	=	.700m
1985	2.1m	x	1.049 (one year)	=	2.203m
1986	.7m	x	1.097 (two years)	=	.768m
					<u>3.671m</u>

The advantage of composite indices such as those provided by OSD in their guidance is that all of the work is already done for you.

Sample OSD Inflation Indices:

SAMPLE INDICES\*

OSD INFLATION INDICES: OTHER PROCUREMENT ARMY (OPA), APPROPRIATION

FISCAL YEAR 1984 BASE YEAR

	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>	<u>FY 87</u>	<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>
<u>ESCALATION RATE</u>	1.0430	1.0490	1.0460	1.0430	1.0400	1.0370	1.0370
<u>COMPOUND INDICES</u>	1.0000	1.0490	1.0973	1.1444	1.1902	1.2343	1.2799
<u>COMPOSITE INDICES</u>	1.0928	1.1357	1.1817	1.2271	1.2727	1.3198	1.3686
<u>SPENDOUT RATES</u>	.0600	.3400	.3200	.2074	.0489	.0277	.0000
1st Yr	2nd Yr	3rd Yr	4th Yr	5th Yr	6th Yr	7th Yr	

\*From 3 May 1984 DAKCOM Inflation Guidance

SAMPLE OSD INDICES

(CHART IS USED IN EXAMPLE ON FOLLOWING PAGE)

SAMPLE "OTHER PROCUREMENT ARMY" INDEX

Hand Calculation of the OSD Composite

<u>FY 84</u> <u>Base Year</u>		<u>Spendout Rate</u>		<u>Compound Index</u>		
1st Year	FY 84	6%	x	1.0000	=	.060
2nd Year	FY 85	34%	x	1.0490	=	.357
3rd Year	FY 86	32%	x	1.0973	=	.351
4th Year	FY 87	21%	x	1.1444	=	.240
5th Year	FY 88	4%	x	1.1902	=	.048
6th Year	FY 89	3%	x	1.2343	=	.037
7th Year	FY 90	<u>0%</u>	x	<u>1.2799</u>	=	<u>.000</u>
		100%		FY 84 Base Composite Index for OPA		<u>1.093</u>

Referring to the chart on the previous page, it is seen that the index has a value of 1.092. (The figure 1.093 is due to rounding.) This is how a composite index is calculated. It will be obvious that a single multiplication of a constant dollar cost by a composite index does a lot of work in one math operation.

EXAMPLE:

Suppose we have a 150 million dollar generator project. Applying the composite index =  $(150\text{m}) \times (1.0928) = 163.9\text{m}$ . The single multiplication in the example does all of the following work:



# GENERATOR EXAMPLE

<u>FY 84</u> <u>Base Year</u>		<u>Spendout</u> <u>Rate</u>		<u>Total Project</u> <u>Cost</u>		<u>Compound Index</u>		<u>Inflated</u> <u>Dollars</u>
1st Year	FY 84	6%	x	150m	x	(1.0000)	=	9.0m
2nd Year	FY 85	34%	x	150m	x	(1.0490)	=	53.5m
3rd Year	FY 86	32%	x	150m	x	(1.0973)	=	52.7m
4th Year	FY 87	21%	x	150m	x	(1.1444)	=	36.0m
5th Year	FY 88	4%	x	150m	x	(1.1902)	=	7.1m
6th Year	FY 89	3%	x	150m	x	(1.2343)	=	5.6m
7th Year	FY 90	0%	x	150m	x	(1.2799)	=	0.0m
								<u>163.9m</u>

FY 84 Base Year

Estimate in Inflated Dollars

In short, the composite index does all of the work performed in the example above - spreading, inflating, and adding in one simple operation:

$$150m \times (1.093) = \underline{\underline{163.9}}$$

#### 4. INTRODUCTION TO THE INFLATION INDICES

Several types of inflation indices are used at this Command. They are discussed and illustrated below.

a. Forecasted Indices. Indices which provide an estimate of what inflation will be in the future. These indices are used to inflate cost estimates and budget projections for projects which haven't occurred yet. The only allowable indices for cost and budget studies to be submitted to higher authority are developed for the Office of the Secretary of Defense (OSD) by the Office of Management and Budget (OMB) and are handed down to the MACOM's by HQ AMC. These indices are called the OSD/AMC Indices or the AMC Inflation Package. Sample pages from an actual AMC Package follow with an explanation of the guidance and terminology contained therein.

b. Historical Indices. Indices which capture inflation from the past until now. They are used to update past procurement prices or other costs so that information on costs from past projects can be used in today's estimates. A page of index numbers for Rubber and Plastic Products, taken from Cost Memorandum 84-5, the Troop Support Inflation Program, is included as an example.

**FORECASTED INFLATION INDICES**

**Sample Document with Explanatory Notes**

## AMC INFLATION GUIDANCE PACKAGE



DEPARTMENT OF THE ARMY  
HEADQUARTERS US ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND  
3001 EISENHOWER AVENUE, ALEXANDRIA, VA. 22333

DRCCP-ER

SUBJECT: Inflation Guidance

SEE DISTRIBUTION

1. Reference letter, DRCCP-ER, HQ, DARCOM, 27 April 1983, subject: Revised Inflation Indices.

2. This letter furnishes new inflation indices recently received from Headquarters, Department of the Army (DA) which supersede those indices provided by referenced letter. These indices reflect the latest Office of Management and Budget economic assumptions. They are to be used in the presentation of the fiscal year (FY) 1985 budget and supporting congressional justification materials, selected acquisition reports (SARs) for December 1983, Nunn-McCurdy reporting, and FY 1986-1990 program objective memorandum (POM) submissions. Base year FY 1983 will be used in repricing the FY 1985 budget and the December 1983 SAR submissions. Base year FY 1984 will be used for all other pricing unless specific instructions provide otherwise.

3. Enclosures 1-9 contain the revised inflation indices. Specific appropriation guidance is provided below.

a. Research, Development, Test, and Evaluation, Army (RDTEA) (Enclosure 1):

(1) The nonpay portion of all RDTEA projects will be inflated for both budget estimates and life cycle cost estimates.

(2) The in-house salary portion of RDTEA projects will not be inflated for budget estimates. For life cycle cost estimates the in-house salary costs for each RDTE project will be inflated using the operation and maintenance, Army (OMA) rates.

b. Procurement Appropriations (PAs) (Enclosures 2-6): Indices are provided for the PA to include aircraft, missiles, weapons and tracked combat vehicles, ammunition, and other procurement, Army (OPA).

(1) All PA will be inflated for both budget estimates and life cycle cost estimates.

1.  
Office of  
Issue-AMC  
Cost Anal.

2.  
Application

3.  
Directions  
for Use

# AMC INFLATION GUIDANCE PACKAGE CONTINUED .....

DRCCP-ER

SUBJECT: Inflation Guidance

5. Product Improvement Management Information Reports (PRIMIRs) will be prepared using the attached indices. The PRIMIR reports will be inflated using the indices for the appropriation which provides the source of funds. Separate HQ, DARCOM guidance will be issued by the Product Improvement Branch, Directorate for Development, Engineering and Acquisition (DRCDE-PIF).

6. The attached indices will be used in the preparation of the 31 December 1981 selected acquisition reports in conjunction with separate HQ, DARCOM guidance issued by DRCDE-PII.

7. Commercial activities scheduled for review will be prepared using the attached indices. Separate guidance on the preparation of these cost estimates will be issued by the HQ, DARCOM commercial activities functional proponent, the Directorate for Management.

8. The date appearing on each of the enclosures will be used in all verification statements relative to inflation.

9. Questions relating to inflation guidance should be directed to the HQ, DARCOM inflation focal point, Mr. Norman Draper, DRCCP-ER, AUTOVON 284-9090/9105.

FOR THE COMMANDER:

9 Encl  
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DRCRE

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US ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER, ATTN: DRSHC-RAC(D), DOVER, NJ 07801

4.  
Specific  
Guidance

5.  
Verification  
Date

6.  
AMC Point  
of Contact

# AMC INFLATION GUIDANCE PACKAGE

10.  
Date Issued  
By HQ DA

9.  
Appropriation

8.  
Bridging  
Factor

APR 17 1984

OTHER PROCUREMENT

	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990
ESCALATION RATE	1.0700	1.0490	1.0430	1.0490	1.0460	1.0470	1.0400	1.0370	1.0370
BASE YEAR 1982									
COMPOSITE INDICES	1.0000	1.0490	1.0441	1.1477	1.2035	1.2521	1.3022	1.3504	1.4094
COMPOSITE INDICES	1.0000	1.1435	1.1926	1.2425	1.2930	1.3425	1.3924	1.4440	1.4974
BASE YEAR 1983									
COMPOSITE INDICES	.9533	1.0000	1.0430	1.0941	1.1444	1.1938	1.2414	1.2873	1.3350
COMPOSITE INDICES	1.0422	1.0901	1.1398	1.1845	1.2328	1.2798	1.3274	1.3785	1.4274
BASE YEAR 1984									
COMPOSITE INDICES	.9140	.9568	1.0000	1.0490	1.0973	1.1444	1.1902	1.2343	1.2799
COMPOSITE INDICES	.9992	1.0451	1.0928	1.1357	1.1817	1.2271	1.2727	1.3198	1.3666
BASE YEAR 1985									
COMPOSITE INDICES	.8713	.9140	.9533	1.0000	1.0460	1.0910	1.1344	1.1764	1.2201
COMPOSITE INDICES	.9525	.9963	1.0417	1.0826	1.1285	1.1697	1.2132	1.2581	1.3047
FY 1991									
ESCALATION RATE	1.0370	1.0370	1.0370	1.0370	1.0370	1.0370	1.0370	1.0370	1.0370
BASE YEAR 1982									
COMPOSITE INDICES	1.4522	1.5059	1.5614	1.6194	1.6793	1.7415	1.8059	1.8727	1.9420
COMPOSITE INDICES	1.5528	1.6102	1.6698	1.7316	1.7957	1.8631	1.9310	2.0025	2.0768
BASE YEAR 1983									
COMPOSITE INDICES	1.3943	1.4356	1.4887	1.5438	1.6009	1.6601	1.7215	1.7852	1.8513
COMPOSITE INDICES	1.4803	1.5350	1.5918	1.6507	1.7118	1.7751	1.8409	1.9089	1.9796
BASE YEAR 1984									
COMPOSITE INDICES	1.3273	1.3764	1.4273	1.4801	1.5349	1.5917	1.6506	1.7116	1.7750
COMPOSITE INDICES	1.4192	1.4717	1.5262	1.5827	1.6412	1.7020	1.7649	1.8312	1.8979
BASE YEAR 1985									
COMPOSITE INDICES	1.2693	1.3121	1.3606	1.4110	1.4632	1.5173	1.5735	1.6317	1.6921
COMPOSITE INDICES	1.3529	1.4030	1.4549	1.5087	1.5646	1.6225	1.6825	1.7447	1.8093

14.  
Spendout Rates  
By Fiscal Year

OUTLAY RATES

	1ST YEAR	2ND YEAR	3RD YEAR	4TH YEAR	5TH YEAR	6TH YEAR	7TH YEAR
1982	.0095	.3238	.3267	.2074	.0449	.0317	0.0000
1983	.0630	.3178	.3300	.2074	.0449	.0317	0.0000
1984	.0630	.3400	.3200	.2074	.0449	.0317	0.0000
1985	.0630	.3421	.3245	.2074	.0449	.0317	0.0000

## EXPLANATION OF AMC INFLATION GUIDANCE PACKAGE

1. Office of Issuance. Office at higher headquarters responsible for the distribution of the indices to this Command.
2. Application. A list of the documents, studies, and reports to which the indices apply.
3. Directions for Use. Self-explanatory.
4. Specific Guidance. Self-explanatory.
5. Verification Date. Identifies the date of record for the inflation indices for the purpose of identifying the index numbers.
6. AMC Point of Contact. Individual at AMC Headquarters who is tasked with answering questions which cannot be answered at the local level, and with resolving policy disputes and other problems at the headquarters level.
7. Base Year. The year of reference for an index. The base year value is defined to be 1.000 and changes (usually grows) each year thereafter. Cost analyses and budget studies specify a base year so that they may be compared with other inflated cost and budget estimates. The OSD/AMC indices usually provide four different base years to choose from.

8. BRIDGING FACTOR. The number which bridges the gap between the earliest base year and the previous year. The earliest base year on the sample inflation index page for Other Procurement Army (OPA) is FY 1982 . Analysts with FY 81 data use the bridging factor to move their data up to FY 82, so that the inflation guidance can be applied.

9. APPROPRIATION. The congressional accounting categories under which money is set aside for Army projects.

10. DATE. Date the indices were issued at HQDA to be forwarded to HQ AMC.

11. ESCALATION RATE. A one-year inflation factor. The escalation factor for FY 1984, for example, captures the one year of inflation experienced from FY 83 to FY 84.

12. COMPOUND INDEX. A multi-year inflation index produced by compounding (multiplying) individual escalation rates.

13. COMPOSITE INDEX. An index used to inflate multi-year projects. It is calculated by inflating the percentage of funds spent each year (spendout or outlay percentages) by the appropriate compound inflation factor.

14. SPENDOUT RATES. Average spendout rates by appropriation for all of the Army's projects.



**HISTORICAL INFLATION INDICES**

**Sample Documents with Explanatory Notes**

# 1. "Associated Listing"

Reprinted from the Troop Support Inflation Program

## PPI CODES AND ASSOCIATED TROSCOM ITEMS

The following Producer Price Indexes have been associated with the corresponding TROSCOM OPA items for a considerable period of time, and have been used to estimate current prices based on past procurement prices:

<u>Producer Price Index Title and Code</u>	<u>TROSCOM OPA Item</u>
Rubber and Plastic Products PPI Code 07	Collapsible Tanks
Heating Equipment PPI Code 10-6	Air Conditioners Heaters
Fabricated Structural Metal Products PPI Code 10-7	AVL Bridge (Not including Tanks chassis) Tanks Other Bridges
Machinery and Equipment PPI Code 11	Power Plant (MUST) Firefighting Equipment Forklift Trucks
Construction Machinery and Equipment PPI Code 11-2	Pumps Compressors
Watercraft/Small Ships Index provided to TROSCOM by U.S. Naval Sea Systems	Watercraft
Special Industry Machinery and Equipment PPI Code 11-6	Theodolites Tape Equipment Surveying Instruments
Electrical Machinery Equipment PPI Code 11-7	Generator Light Sets Utility Elements
Railroad Equipment PPI Code 14-4	Railroad Equipment
Industrial Commodities Average of PPI Codes 03 through 15	All other items Not Included in the above

## HISTORICAL INFLATION INDICES

(FROM THE TROOP SUPPORT INFLATION PROGRAM PUBLISHED BY COST ANALYSIS BRANCH)

# TROOP SLAPSHOT HISTORICAL ISOLATION INDICES

PLS CODE: 07 RUBBER AND PLASTIC PRODUCTS

**2. BLS Code**

### 3. Monthly Data

[illegible]

## EXPLANATION OF HISTORICAL TROOP SUPPORT INDICES

1. Associated Listing. A chart or schedule which associates TROSCOM OPA items with specific Producer Price Index (PPI) codes.
2. BLS Code. Bureau of Labor Statistics Producer Price Index (PPI) code. A code which can contain up to eight digits, which identifies raw materials and other products at the wholesale level.
3. Monthly Data. Monthly data from the Producer Price Index, displayed by month, which are used to produce the historical fiscal year inflation indices and factors used to adjust past costs.
4. Inflation Index. Fiscal year inflation index based on Calendar Year (CY) 1967 = 100.0.
5. Inflation Factor. A number which, when multiplied times the old cost, yields the current estimated cost. For example, if the fiscal year factor for 1975 is 1.64, then (1975 cost) x (1.64) = (1983 cost).

## 5. CONSIDERATIONS TO BE REVIEWED BEFORE APPLYING ANY INFLATION INDEX

Indices track an item, or group of items, based on certain physical and operational characteristics. It is good procedure to compare the item to which an index is to be applied with the item, or group of items, on which the index is based, to determine whether the index is appropriate for use. Additional questions which might be posed are the following:

a. Is the item which is to be procured the same item as in the previous procurement whose old price is to be updated? Will it be made of the same or similar materials and with the same construction?.

b. Is the number of items to be purchased in the new procurement the same, or similar to that in the old procurement? To update a unit cost for 10,000 items and use it for a procurement of 500 items doesn't usually make sense. Obviously, the unit price could be much lower for 10,000 and would not reflect actual unit cost for a 500 unit procurement.

## 6. TECHNICAL ASSISTANCE

DA directs the use of the OSD indices for inflating cost and budget estimates. Further, AMC approves historical indices developed by Major Subordinate Commands after they meet appropriate review and evaluation criteria. The Bureau of Labor Statistics produces thousands of wage and price indices that can be used in government contracting and estimating work. Data Resources, Inc. (DRI) forecasts many indices in the Bureau of Labor Statistics series. Given the number of indices and their complexity, it isn't always a simple task to select an index appropriate to the task at hand. The Inflation Focal Point, Cost Analysis Branch, Cost and Systems Analysis Division, Comptroller, is tasked by TROSCOM Regulation 37-2 with providing technical assistance and guidance in matters involving inflation.

The Cost Analysis Branch, Cost and Systems Analysis Division, Comptroller, can supply guidance or documents concerning inflation to assist other directorates in carrying out the Command's mission.

Among the documents available from this office are:

- (1) The Standard Army Inflation Methodology. (SAIM)
- (2) "The AMC Inflation Guidance Package."
- (3) The AMC Historical Inflation Report.
- (4) The Troop Support Inflation Program.
- (5) The Historical Research and Development Inflation Indices for U.S. Army Troop Support Items.
- (6) "General Guidance for PRIMIR Submissions."
- (7) Methodology for Updating Army Materiel Plan (AMP) Cost Estimates.
- (8) "The U.S. Cost Forecasting Service Near Term Review."

APPENDIX A

SAMPLE PROBLEMS FOR TROOP SUPPORT ITEMS



## APPENDIX A

### SAMPLE PROBLEMS FOR TROOP SUPPORT ITEMS

Index numbers required to do these problems are displayed on p. A-7.

1. If a collapsible fuel tank cost \$6000 in FY 75.

What is its estimated cost in FY 83?

Answer

Table 07 (page A-7 of this appendix) lists the inflation factor for FY 75 to be 1.64.

$$\begin{aligned}(\text{FY 83 cost}) &= (\text{FY 75 cost}) \times (\text{FY 1975-83 inflation factor}) \\ &= (\$6000) \times (1.64) = \$9840\end{aligned}$$

2. GS employee cost for a TROSCOM Branch was \$14,672 per month for seven employees in FY 84.

a. What would the salary cost be in FY 88, if the same grades and steps were maintained?

Answer

The inflation index for O&MA for FY 1984-FY 1988 is 1.1902.

$$(\text{FY 84 cost}) \times (\text{FY 88 compound index}) = (\text{FY 88 cost})$$

$$(\$14,672) \times (1.1902) = \$17,463$$

3. A foreign country is interested in purchasing some generators from Army inventory as an FMS customer. The generators are in new condition, and cost \$7,372 in 1981. What should the Army charge the FMS customer in FY 1984 dollars?

Answer

This problem is solved in two steps:

Step One: Historical Index

This moves the price from 1981 to 1983.

$$(\text{FY 1981 price}) \times (\text{FY 1981-83 inflation factor}) = (\text{FY 1983 price})$$

$$(\$7,372) \times (1.10) = \$8109.20$$

Step Two: Projected Indices (OSD)

This takes the price in FY 1983 dollars and puts it  
in FY 1984 dollars

(FY 1983 price) x (FY 1984 OPA escalation factor) = (FY 1984 price)

(\$8109.20) x (1.0430) = \$8457.90

4. Procurement and Production has gone out for a procurement of 30,000 carburetors for Military Standard (MIL STD) engines. A similar quantity was procured in 1971 at a unit price of \$113 each. The current price (FY 84) from a sole source bid is \$281. Is this price reasonable?

Answer

$$\begin{aligned}\text{Est. FY 83 price} &= (\text{FY 1971 price}) \times (\text{FY 1971-83 infl. factor}) \\ &= (\$113) \times (2.50) = \$282.50\end{aligned}$$

$$\begin{aligned}\text{Estimated FY 84 price} &= (\text{EST FY 83 price}) \times (\text{FY 84 escalation factor}) \\ &= (282.50) \times (1.043) = \$294.65\end{aligned}$$

Based on circumstantial evidence, this price appears reasonable.

5. A project manager's office has a target price for a landing craft of \$82,000 established in 1976. In FY 83, the landing craft cost the government \$167,612. Is this current cost in line with the targeted cost of 1976?

Answer

$$\begin{aligned}\text{FY 76 price} &= (\text{FY 83 price}) \div (\text{FY 1976-83 watercraft factor}) \\ &= (167,612) \div 1.703 \\ &= \$98,422\end{aligned}$$

The current cost is not in line with the targeted cost. The item, method of production, materials, and conditions of procurement must be analyzed to expose the reasons for the discrepancy.

6. An RPO plans to buy kits to upgrade a water pump currently in the field. He plans to do it on an attrition basis. The kits currently cost \$192.50. He plans to apply the kits over a five-year period beginning this year, but doesn't know the schedule for application yet. How much should he budget for the 2,600 kits he needs to purchase, given his current knowledge?

Answer

The composite index provides an estimate for a program's inflation using average Army spendout rates. The composite index for Other Procurement Army (OPA) for FY 84 is 1.0928.

$$\begin{aligned}\text{cost per kit (inflated dollars)} &= (\text{FY 84 kit cost}) \times (\text{FY 84 composite}) \\ &= (\$192.50) \times (1.0928) \\ &= \$210.36\end{aligned}$$

$$\begin{aligned}\text{amount budgeted} &= (\text{no. of kits}) \times (\text{cost per kit}) \\ &= 2,600 \times \$210.36 \\ &= \$546,936.00\end{aligned}$$

# **HISTORICAL INFLATION FACTORS**

## **for Troop Support Items**

### **(Collapsible Tanks) Rubber and Plastic PPI Code 07**

FY 83 1.00  
FY 82 1.01  
FY 81 1.06

FY 80 1.14  
FY 79 1.29  
FY 78 1.40  
FY 77 1.46  
FY 76 1.56

FY 75 1.64  
FY 74 2.01  
FY 73 2.20  
FY 72 2.22  
FY 71 2.23

### **(MIL STD Engines) Machinery and Equipment Code 11**

FY 83 1.00  
FY 82 1.03  
FY 81 1.10

FY 80 1.22  
FY 79 1.36  
FY 78 1.48  
FY 77 1.59  
FY 76 1.70

FY 75 1.85  
FY 74 2.24  
FY 73 2.33  
FY 72 2.43  
FY 71 2.50

### **(Generators) Electrical Machinery and Equipment Code 11-7**

FY 83 1.00  
FY 82 1.03  
FY 81 1.10

FY 80 1.21  
FY 79 1.35  
FY 78 1.46  
FY 77 1.56  
FY 76 1.64

FY 75 1.75  
FY 74 2.05  
FY 73 2.13  
FY 72 2.16  
FY 71 2.19

### **Watercraft Index (US Navy)**

FY 83 1.000  
FY 82 1.039  
FY 81 1.113

FY 80 1.216  
FY 79 1.336  
FY 78 1.465  
FY 77 1.589  
FY 76 1.703

### **OMA Compound (OSD Indices)**

FY 84 1.0000  
FY 85 1.0490  
FY 86 1.0973

FY 87 1.1444  
FY 88 1.1902  
FY 89 1.2343  
FY 90 1.2799  
FY 91 1.3459

### **OPA Compound (OSD Indices)**

FY 83 1.0000  
FY 84 1.0430  
FY 85 1.0941

FY 86 1.1444  
FY 87 1.1936  
FY 88 1.2414  
FY 89 1.2873  
FY 90 1.3350

OSD Composite for FY 84 for other Procurement Army is 1.0928.

Reprinted for the Troop Support Inflation Program.

(Do not use for actual computations in Cost or Budget Studies.)

APPENDIX B

GLOSSARY OF INFLATION TERMS

## APPENDIX B

### GLOSSARY OF INFLATION TERMS

1. AMC Guidance Package: A package forwarded to the Major Subordinate Commands (MSC's) by HQ AMC, consisting of two items: (1) The OSD inflation indices for budget and cost work and (2) detailed instructions on how to interpret the OSD indices and how they are to be applied to cost and budget documents.
2. AMC Historical Inflation Report: An annual report which summarizes the historical inflation indices used throughout the Army and compares them with other DOD indices and price deflators.
3. Appropriation Inflation Indices: Inflation indices developed to inflate specific appropriations used by the Department of the Army, such as Operations and Maintenance, Army (OMA) or Other Procurement, Army (OPA).
4. Base Year: The first year (year of reference) for an index. The index is 1.0000 in this year and changes each succeeding year.
5. Bureau of Labor Statistics (BLS): A bureau within the Department of Labor which specializes in collecting, interpreting, publishing, and distributing wage and price data for the United States. It produces the Consumer Price Index (CPI), Produce Price Index (PPI), in Employment and Earnings (E&E) monthly.



6. Calendar Year (CY): The twelve-month year starting in January and ending in December. The basic accounting time frame for the Bureau of Labor Statistics wage and price data is the calendar year (CY).

7. Calendar Year Index: An index developed by the averaging wage or cost data for the twelve months from January to December.

8. Change of Base Year: The change of the point of reference for an estimate from one year to another. This is done by multiplying all the values in the estimate by a compound inflation index.

9. Composite Index: An index used to inflate a multi-year project. It is calculated by inflating the percentage of funds spent each year by the appropriate compound inflation factor.

10. Compound Index: An inflation index which translates cost forward or backward for multi-year period. It is the product of the individual (yearly) escalation factors. For example, if the escalation factor for FY 1985 to FY 1986 were 8% and the escalation factor from FY 1986 to FY 1987 were 7%. Then the compound index for FY 1985 to FY 1987 is  $(1.08) \times (1.07) = 1.1556$ .

11. Constant Dollars: A cost or budget estimate in constant dollars is an estimate which has not been inflated. Any year's dollars may be used as the base year. For example, an estimate can be in FY86 or FY89 constant dollars (prices).

12. Consumer Price Index (CPI): An index which is based on the average market basket of goods purchased by the U.S. consumer. A change in the CPI indicates a change in the cost of living for an average American family.

13. Cost Growth: Cost growth is a term related to the net change of an estimated or actual amount over a base figure previously established. The base figure must be relatable to a program, project, or contract, and be clearly identified including source, approval authority, specific items included, specific assumptions made, date, and amount.

14. Cost Overrun: A cost for a system which is larger than the amount budgeted due to management oversight or miscalculation. The cost overrun is the difference between the cost and amount budgeted.

15. Cost Tracking: Generally, a process which collects and evaluates data for determining reasons for variation between successive cost estimates or between planned versus actual costs.

16. Current Dollar Estimate: Estimate in inflated dollars.

17. Current Dollars: Another name for inflated dollars. Also referred to as "then year" dollars.

18. Data Resources, Inc. (DRI): A subsidiary of McGraw-Hill Publishing Company which forecasts prices and wages for the Office of Management and Budget and many commercial firms. Currently considered to be the best source in the U.S. for forecasted commodity and wage costs by Bureau of Labor Statistics classification. Publishes the U.S. Cost Forecasting Service Review.

19. Economic Price Adjustment (EPA): A mathematical formula put into procurement contracts which allows the purchase price of an item to change as inflation causes the contractor's labor and material costs to rise. The goal is to protect the contractor from unforeseen inflation and the government from unreasonably high bids due to market uncertainties.

20. Engineering Index: A cost index which is based upon detailed engineering data which describe labor and material and how they are combined to produce the item to be purchased.

21. Escalated Dollars: "Current" or "inflated" dollars.

22. Escalation Factor: A one-year inflation factor which allows a cost figure to be translated from one year's dollars to the next.

23. Escalation Schedule: A schedule in a procurement contract which indicates how costs will escalate, given changes in certain parameters specified by the contract.

24. Escalation Clause: A clause in a contract which allows the contractor to increase the price charged the customer when certain conditions are met.

25. Fiscal Year (FY): The standard government year for accounting purposes. Before 1977, the fiscal year began in July and ended in June. Starting in 1977, the fiscal year has begun in October and has ended in September.

26. Fixed Market Basket Index: An index based on a group of items which does not change in quantity or quality over time. Also called a Laspeyre's index.

27. Forecasted Indices: Forward looking indices or projections of current trends for use in cost analysis or budgeting. Examples of forecasted indices are the OSD indices, distributed by HQ AMC to the Major Subordinate Commands for cost and budget study preparation, and the Data Resources, Inc. (DRI) indices which forecast commodity prices by Bureau of Labor Statistics code.

28. Forecast: A pictorial view of the future summarized by key data, as estimated for the future time periods of interest.

29. Generic Index: An index which pertains to a group of similar items, rather than one specific item.

30. Historical Inflation Index: An index which tracks cost changes over time, from a point in the past up to the current date.

31. Historical Inflation Program: A computational methodology used to produce historical inflation indices. Normally, constituent material and labor indices are combined to get the historical index for the end item. AR 37-63, the Standard Army Inflation Methodology (SAIM) requires that Bureau of Labor Statistics Producer Price Index (PPI) and Standard Industrial Classification (SIC) codes will be used.

32. Index: A mathematical technique or procedure for tracking cost changes over time. Historical indexes track the movement of cost in the past, up to the current date, whereas projected indexes use statistical procedures, and employ current data and economic indicators, to estimate future price levels.

33. Index Number: A numerical value obtained from an index function by substituting actual data into the equation.

34. Indexing By Similarity: The use of an index for a similar item as a proxy for the desired index, when the desired index does not exist.

35. Indices: Plural of index.

36. Inflated Dollars: Dollars which reflect the purchasing power of the dollar in the year of expenditure.

37. Inflation: A decrease in the purchasing power of the unit of account (i.e., dollar) over time, or equivalently, an increase in the cost of an item due to increases in the costs of the constituent items used in its manufacture.

38. Inflation Factor: A number developed by numerical inversion of an inflation index which allows cost computations to be made easily by the user. An example follows:

Historical Inflation Factors

<u>FY</u>	<u>Index</u>	<u>Factor</u>
84	1.193	1.000
83	1.144	1.043
82	1.076	1.109
81	1.000	1.193

To move a price from FY 82 to FY 84, an analyst would multiply the FY 82 cost by 1.109, the FY 82 factor.

39. Inflation Focal Point: An area within a command, generally Cost Analysis Branch, Office of the Comptroller, which has responsibility for inflation policy and guidance within the Command. This term is commonly associated with the individual who is designated "key man" for that function.

40. Inflation Index: A numerical index that measures inflation over a period of time. Historical inflation indices measure inflation from a point in the past to the present date. Projected indices are a forecast of inflation, given current trends and anticipated supply and demand conditions.

41. Laspeyre's Index: An index in which the market basket is fixed, and only prices vary over time.
42. Monetary Policy: The use of controls over bank lending power, the money supply, and interest rates to affect the economy. Directly affects the rate of inflation.
43. Moving Market Basket Index: An index which is predicated on a commodity or group of commodities which change as time passes. The Consumer Price Index of the 1940's included items such as table model radios and phonographs. The Consumer Price Index of the 1980's has replaced them with solid state color televisions sets and stereo equipment. Also called Paasche Index.
44. Multi-Year Appropriation: An appropriation against which obligations may be made for a specified period of time in excess of one fiscal year.
45. OSD Indices: The Department of Defense inflation indices produced by Data Resources, Inc. for Office of Management and Budget. The indices project inflation by appropriation and list anticipated average spendout rates, so that cost and budget studies with future expenditures can be computed in inflated dollars.
46. Outlay Rate: The rate at which funds are disbursed on a project. The usual method of disbursement is on an accrual basis. The contractor is paid as work is completed. Average spendout or outlay rates for each appropriation are listed in the AMC Inflation Guidance Package.

47. Outlays: The payments made against a contract. Also called disbursements.
48. Outyears: The years beyond the current year and the budget year.
49. Overrun: Costs in excess of the estimated (target) contract cost.
50. Paasche Index: A moving market basket index in which the typical group of items purchased changes as time passes.
51. Points of Change: A measure of change in an index. It is computed as the difference between the value of an index measured at two different points in time. Percentage change is this difference, normalized by the index value in question.
52. Price: Refers to the dollar value a company will sell its product for or commit itself to a contract. Includes profit or fee added to cost.
53. Price Change: A change in price asked by the seller. Market conditions as well as costs for labor and raw materials affect price.
54. Price Index: A ratio which expresses the relationship between prices at two different points in time. Labor and materials are the two basic resources generally considered in constructing a price index. The cost of living index is a form of price index.



55. Producer Price Index (PPI): A price index developed by the Bureau of Labor Statistics which tracks goods and commodities at the wholesale level. Previously called the Wholesale Price Index (WPI).
56. Programming: The process of time phasing resources. Within a project funding may be distributed or programmed over a several year period.
57. Program Year: The fiscal year in the five-year defense program which follows the budget year.
58. Projected Indices: Forecasted inflation indices which provide estimates or relative cost for definite time periods.
59. Spendout Rate: The rate at which funds are disbursed on a project. Also called the outlay rate.
60. Standard Army Inflation Methodology (SAIM): The uniform Army methodology developed for computing historical inflation indices. The method was developed to establish uniformity and comparability among system unique historical inflation indices for major weapon systems. It is based on several fundamental concepts: Cost weighting, engineering estimates, and standardization of the Product Price Index (PPI) and Employment and Earnings (SIC) code data. SAIM was published as Army Regulation 37-63, effective 1 September 1984.

61. Standard Industrial Classification (SIC) System: The method used by the Bureau of Labor Statistics, U.S. Department of Labor, to define job skills across industries. SIC codes are four digits in length. The first two digits determine an industry, the third digit a product specialization, and the fourth a specific product. For example, for labor coded with 3792, the first two digits (37) indicate "transportation industry," the third digit (9) indicates "miscellaneous equipment," and the fourth digit (2) specifies "travel trailers and campers."

62. Surrogate Index: An index which takes the place of another usually due to the non-availability of data on the original index.

63. Then Year Dollars: Dollars which are escalated into the time period of performance of a contract. Sometimes referred to as escalated or inflated costs.

64. Time-Phased Cost: A presentation of the cost results broken down by the period in which the costs occurred rather than a single total cost figure.

65. Troop Support Indices: Historical inflation indices used to update past procurement prices in troop support items. The updated procurement prices are used for replacement cost estimates for repair or replace decisions and foreign military sales cases.

66. Weapon System Unique Index: An inflation index which tracks the cost of a single weapon system over time. The rules and procedures prescribed for construction of such indices are listed in Army Regulation 37-63, entitled the Standard Army Inflation Methodology (SAIM).

67. Wholesale Price Index (WPI): Now called the Producer Price Index (PPI). A price index developed by the Bureau of Labor Statistics (BLS) which tracks goods and commodities at the wholesale level.

### Bibliography

The following documents and publications served as the basic source material for the definitions included in this glossary.

ALMC Pamphlet #ALM-63-3718-H(E), Cost Analysis Definitions, Ft Lee, VA: U.S. Army Logistics Management Center, 1984.

Army Regulation 310-25, Dictionary of United States Army Terms, Washington, D.C.: Headquarters, Dept of the Army, March 1969.

Dictionary of Estimating Terminology, Huntsville, Alabama: National Estimating Society, Summer 1982.

Glossary for Systems Analysis, Washington, D.C.: United States General Accounting Office, October 1969.

Key Cost Analysis Definitions, Washington, D.C.: Headquarters, U.S. Army Materiel Command, October 1972.

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